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<p>(21) International Application Number: PCT/IT91/00027 (22) International Filing Date: 8 April 1991 (08.04.91) (30) Priority data: 20079 A/90 20 April 1990 (20.04.90) IT (71) Applicant (for all designated States except US): COSTRUZIONI ELETTROMECCANICHE NOVARESI S.R.L. [IT/IT]; Corso Milano, 106, I-18100 Novara (IT). (72) Inventor; and (75) Inventor/Applicant (for US only) : NISSOTTI, Mario [IT/IT]; Via Roma, 11/D, I-18100 Novara (IT). (74) Agent: DI GIOVANNI, Italo; Ufficio Brevetti Dott. Ing. Digiovanni Schmiedt, Via Aldrovandi 5, I-20129 Milano (IT).</p>		<p>(81) Designated States: AT, AT (European patent), AU, BB, BE (European patent), BF (OAPI patent), BG, BJ (OAPI patent), BR, CA, CF (OAPI patent), CG (OAPI patent), CH, CH (European patent), CM (OAPI patent), DE, DE (European patent), DK, DK (European patent), ES, ES (European patent), FI, FR (European patent), GA (OAPI patent), GB, GB (European patent), GR (European patent), HU, IT (European patent), JP, KP, KR, LK, LU, LU (European patent), MC, MG, ML (OAPI patent), MR (OAPI patent), MW, NL, NL (European patent), NO, PL, RO, SD, SE, SE (European patent), SN (OAPI patent), SU, TD (OAPI patent), TG (OAPI patent), US. Published With international search report.</p>
<p>(54) Title: AUTOMATIC GARAGE WITH TWO OR MORE INDEPENDENT ELEVATORS IN A REVOLVING AXIAL TOWER</p> <p>(57) Abstract</p> <p>Automatic garage with radial parking places (16) laid out on several floors (13), with an axial revolving tower (20) for vertical and horizontal movement of cars (15) and for parking them in the various spaces (16) comprising two or more radial elevators (35), one operating independently of the others, to permit simultaneous utilization as required of any or all of said elevators (35) in relation to the quantity of cars (15) admitted, and also to permit utilization of functioning elevators (35) if one or other is out of use due to failure.</p>		

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AUTOMATIC GARAGE WITH TWO OR MORE INDEPENDENT ELEVATORS
IN A REVOLVING AXIAL TOWER

The invention concerns an automatic tower garage.

Tower garages, namely large cylindrical garages for parking cars, are well-known constructions.

If the various parking spaces are laid out on several floors, one or more elevators are needed.

On each floor a turning space will obviously be required to allow each vehicle carried in the elevator to make the necessary movements to reach its free space.

To reduce the area needed and make arrival and departure operations speedier, various systems have been devised.

The one most similar to the present invention consists of an axial tower with a cylindrical elevator containing a number of radially disposed places so that each of these lies opposite a place on each floor where parking spaces are laid out all round and suitably oriented.

Transfer of cars from elevators to parking spaces is quick and simple and the overall volume of the whole construction in relation to the number of vehicles it can park is relatively small.

A serious drawback to this system, however, is that any one place in the elevator is conditioned by the others and so if the elevator breaks down the whole garage ceases functioning.

To park or take away even only one car, the whole elevator has to move; level of efficiency is therefore low bearing in mind the dimensions, weight and bulk of an elevator varying according to the number of cars it can carry.

The above invention eliminates these drawbacks offering other considerable advantages as will be explained below.

Subject of the invention is an automatic car park with axial revolving tower for vertical and horizontal transport of vehicles to be assigned to the various parking spaces laid out radially on several floors.

5 The tower comprises two or more radially placed elevators, each independent of the others; in this way all or any of the elevators can be used simultaneously in relation to the numbers of cars to park, and also those functioning can operate if one elevator or another suffers a failure.

10 Horizontally, the elevators are placed at an equal angular distance while the number of radially disposed parking spaces, comprised in an angular segment such as that between two elevators, is a whole number so that, at each stop in the tower, a complete radial space will lie opposite each
15 elevator.

The radial parking spaces on the various floors are vertically aligned to allow a car to be moved from an elevator to the space above or below the one it occupied before, and vice versa, simultaneously with, and independently of what
20 the other elevators are engaged in.

The elevators comprise a projecting, fixed, radial, rectangular platform whose uprights slide in the vertical guides in the tower.

In one advantageous execution each elevator is hung on a
25 number of cables which, after passing round a pulley mounted on a platform fixed to the top of the tower, are hooked to a counterweight sliding within said tower.

The tower is supported by a roller thrust bearing at its base placed below the level at which cars enter, and by a
30 roller bearing at the top fixed to the roof of the car park. Drive is assured by a ratiomotor mounted at the top of the

car park's cylindrical structure, comprising a gear wheel mounted on the ratiomotor's horizontal shaft, that meshes with a horizontal crown gear concentric with the tower, fixed to a discoid platform at the top of said tower.

- 5 In a preferred execution there are four elevators at 90° one from another while on each floor there are 24 radially disposed parking spaces.

At each stop up the tower an electronic control unit operates, with the necessary safety devices, all the elevators
10 even simultaneously.

The advantages of the invention are evident.

Each elevator can serve all the parking spaces in the tower as needed.

- Possible failure of one elevator does not therefore hold
15 up reception or delivery of vehicles.

At every stop in the tower any elevator will be in line with radially laid out parking spaces vertically aligned on the various floors. It is thus possible to move a car from reception point to a parking space on one of the floors irrespective of the other elevators that can simultaneously
20 park or bring down other cars from spaces opposite their stopping places.

- All this can be done securing a reduction in servicing time, compared to what a single elevator can do, proportional
25 to the number of elevators installed.

Yield from such a parking tower is therefore much higher than can be achieved in present towers, with a highly favourable ratio between the number of cars parked, moment by moment, and the amount of space the tower occupies.

- 30 Characteristics and purposes of the invention will be made even clearer by the following example of its execution, illustrated by diagrammatic drawings.

Fig. 1: Side axial view of the tower garage, partially cut through.

Fig. 2: Tower garage seen from above, partially cut away.

Fig. 3: Enlarged detail of the central tower of the car park, side view.

Fig. 4: The central tower seen from above.

The tower garage with its cylindrical structure 10 comprises a cylindrical crown 11 having several floors 13 on which to park cars 15 in the radial spaces 16.

10 The cars are moved from the ground floor 12 where they are received, to the various floors 13 by means of a tower 20 that revolves in line with the cylindrical structure 10. Said tower comprises four radial elevators 35 facing toward the cylindrical crown 11, symmetrical and therefore
15 at 90° one from another.

The number of parking spaces comprised in the horizontal angle of 90° is a whole number so that at the various stopping positions in the tower for parking or removing vehicles, the four elevators, at each floor, will lie opposite four
20 of these spaces enabling simultaneous operations to be carried out in each of them.

The cylindrical structure 21 of the tower 20 is a trellis structure with four pairs 22 of vertical guides for the elevators 35, and is supported at the base by a roller
25 thrust bearing 23, and at the top by a roller bearing 24 with a support 25 sustained by the ceiling 26.

A discoid platform 27 is fixed to the top of the tower 20 and is made to revolve by a ratiomotor 28, supported by the plane 18 forming part of the cylindrical structure 11,
30 by a mechanism comprising the gear wheel 30 mounted on the ratiomotor's shaft meshing with the crown gear 31 mounted on the platform 27.

The elevators 35 comprise a rectangular horizontal platform 36 fixed to vertical uprights 37 strengthened by struts 38.

At the top and bottom of said uprights, the pairs of rollers 39 are placed to slide in the guides 22 in the tower.

Each lift is hung on the cables 45 passing round the pulley 46 revolving on supports 47 to the platform 27 and are joined to the counterweight 48 at the other end.

The pulleys 46 are worked by the ratiomotors 50 mounted on said platform 27.

As the drawings clearly show, all four elevators are independent one from another.

As the various positions of angular stoppage in the tower correspond to the angular alignment of all the radial parking slots on each floor, any one of said four elevators can serve any one of all said parking slots comprised on the various floors of the parking tower's cylindrical crown.

CLAIMS

1. Automatic garage of a cylindrical structure (10) and radial parking spaces (16) laid out on several floors (13) with an axial revolving tower (20) for moving the cars (15) both vertically and horizontally and assigning them to the various parking spaces (16), characterized in that the tower (20) comprises two or more radial elevators (35) one independent of the other so that any or all of said elevators (35) can be used as necessary both if needed by the number of cars (15) and in order to have some elevators (35) functioning in the event of failure.
2. Automatic garage as in claim 1, characterized in that, horizontally, the angular space between elevators (35) is the same while the number of radial parking slots (16) comprised in an angular space such as that between one elevator (35) and another, is a finite number so that at each stopping place in the tower (20) there will be a radial parking slot (16) opposite each elevator (35).
3. Automatic garage as in claim 1, characterized in that the radial parking spaces (16) on the different floors (13) are vertically aligned to allow cars (15) to be moved from the elevators (35) to the parking spaces (16) opposite said elevators at each floor (12) (13), and vice versa, simultaneously and independently between one elevator (35) and another.
4. Automatic garage as in claim 1, characterized in that the elevators (35) comprise a projecting, fixed, radial, rectangular platform (36) and uprights (37) sliding on vertical guides (22) in the tower (20).

5. Automatic garage as in claim 1,
characterized in that the elevators (35) are hung on cables
(45) which, after passing round a pulley (46) mounted on
a platform (27) fixed to the top of the tower (20), are
5 hooked to a counterweight (48) sliding inside said tower
(20).

6. Automatic garage as in claim 1,
characterized in that the tower (20) is supported on a
roller thrust bearing (23) at its base, placed below the
10 floor (12) where the cars enter, and a roller bearing (24)
at the top fixed into the ceiling (26) of the garage.

7. Automatic garage as in claim 1,
characterized in that the radial parking spaces (16) are
arranged within a structure (11) shaped like a cylindrical
15 crown.

8. Automatic garage as in claim 1,
characterized in that the tower (20) revolves in both di-
rections, as required.

9. Automatic garage as in claim 1,
20 characterized in that the tower (20) is driven by a ratio-
motor (28), placed at the top of the cylindrical structure
(10) of said garage, comprising a gear wheel (30), mounted
on the horizontal shaft of said ratiomotor (28), that meshes
with a horizontal crown gear (31) concentric with the tower
25 (20) fixed to a discoid platform (27) at the top of said tower
(20).

10. Automatic garage as in claim 1,
characterized in that there are four elevators (35) spaced
at 90° one from another.

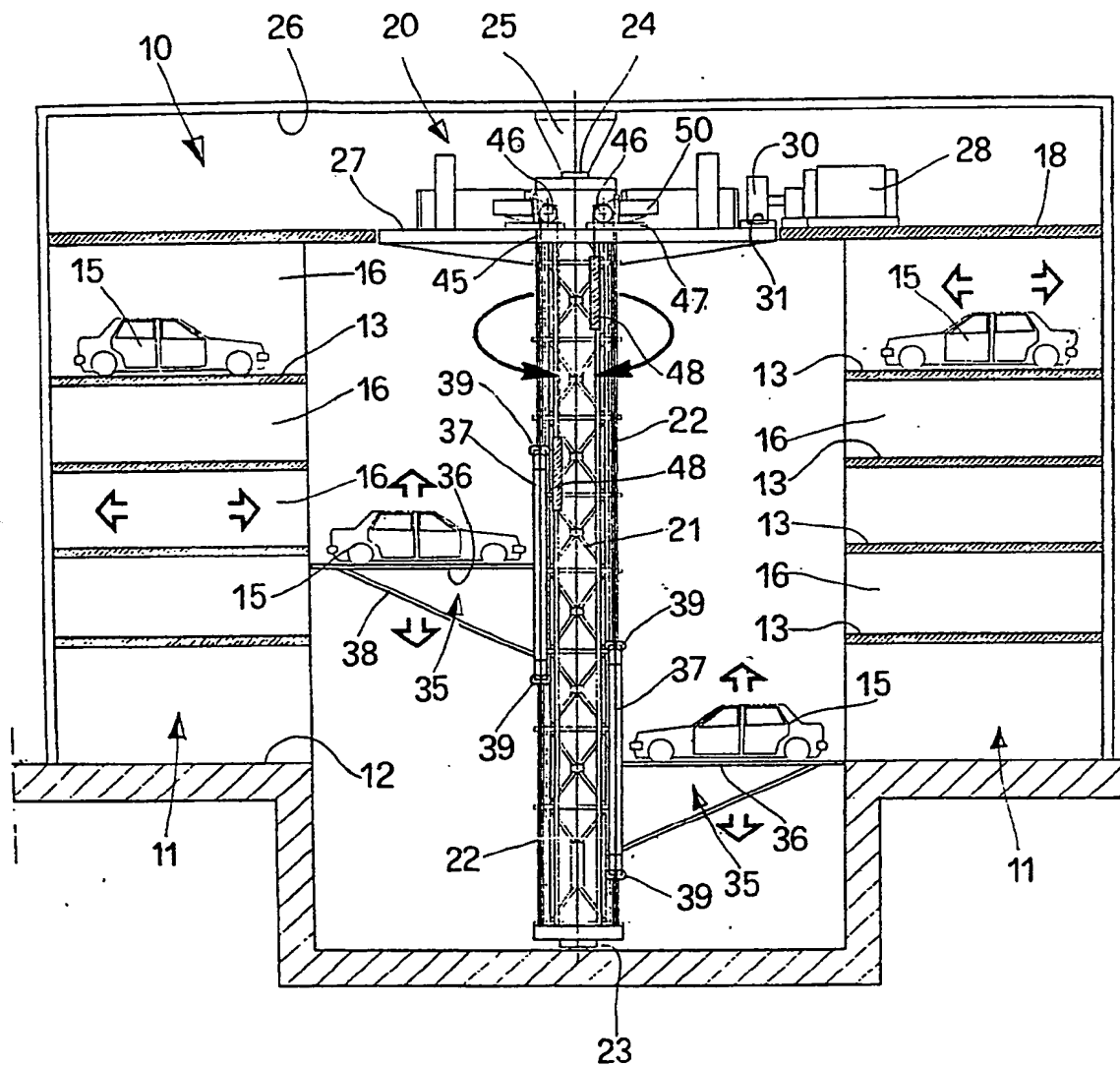
30 11. Automatic garage as in claim 1,
characterized in that there are 24 radial parking spaces (16)

on each floor (12) (13).

12. Automatic garage as in claim 1,
characterized in that, at each stop in the tower (20), an
electronic control unit operates, even simultaneously and
5 with the necessary safety devices, all the elevators (35)
as well as operating entry of a car (15) or simultaneously
of more than one, from the reception floor (12) to one or
more elevators (35), raising or lowering, by means of other
elevators (35), other cars (15) and their transfer to the
10 parking places (16) opposite, on the different floors (12)
(13), or transfer of cars (15) from parking places (16) to
elevators (35), thus ensuring optimum exploitation of the
tower garage at all moments.

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fig. 1

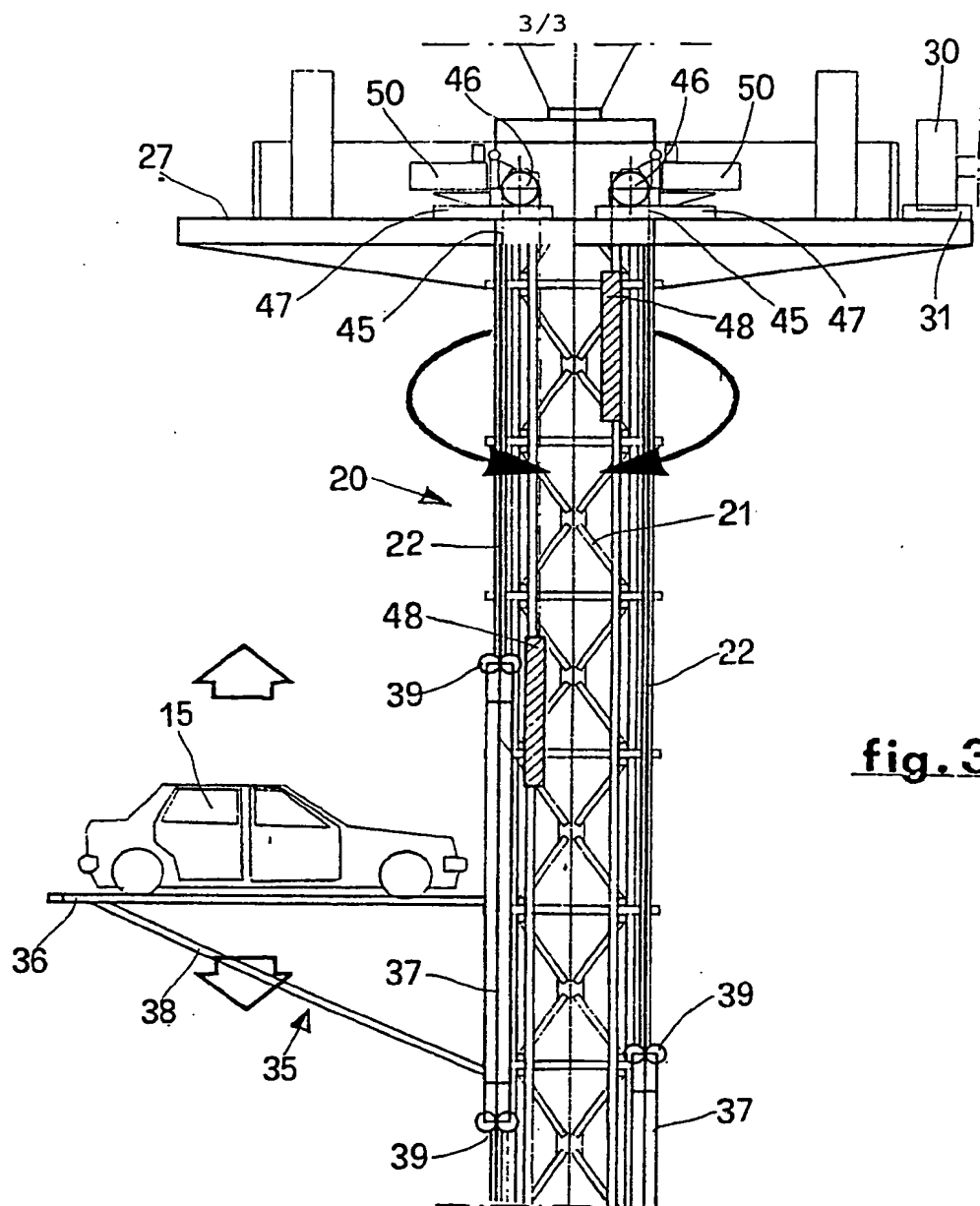


fig. 3

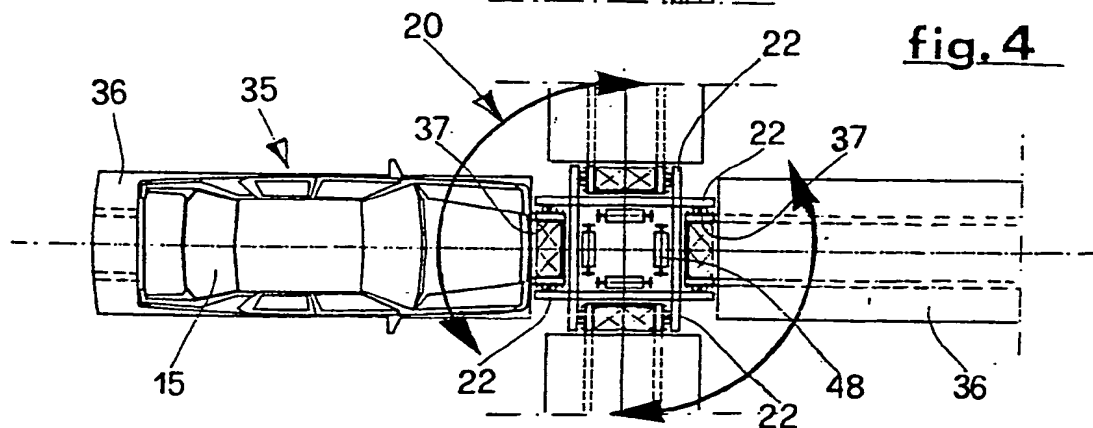


fig. 4

INTERNATIONAL SEARCH REPORT

International Application No.

PCT/IT 91/00027

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) *		
According to International Patent Classification (IPC) or to both National Classification and IPC IPC ⁵ : E 04 H 6/18		
II. FIELDS SEARCHED		
Minimum Documentation Searched †		
Classification System	Classification Symbols	
IPC ⁵	E 04 H 6/00	
Documentation Searched other than Minimum Documentation to the extent that such Documents are included in the Fields Searched ‡		
III. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of Document, † with indication, where appropriate, of the relevant passages ‡	Relevant to Claim No. ‡
A	EP, A2, 0 306 058 (BURGER) 08 March 1989 (08.03.89), see totality.	1, 7, 8
A	US, A, 3 613 909 (SALLOUM) 19 October 1971 (19.10.71), see totality.	1, 7, 8
A	WO, A1, 86/02 687 (BAYLON) 09 May 1986 (09.05.86), see claims; fig. 1-6.	1, 7, 8
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IV. CERTIFICATION		
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EP-A2- 306058	08-03-89	EP-A3- 306058 DE-A1- 3830136	05-07-89 16-03-89
US-A - 3613909	19-10-71	DE-A - 1918559 JP-B4-48020397 US-A - 4023687 US-A - 4103787 US-A - 3382990 US-A - 3378151	30-10-69 20-06-73 17-05-77 01-08-78 14-05-68 16-04-68
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